

Research Paper on Operational Risk

Summary

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EXECUTIVE SUMMARY

Introduction

Operational risk losses are high profile, uncertain, and headline grabbing. Despite the best endeavours of companies, material operational risk losses keep occurring. In the insurance sector, operational risk losses tend to be less dramatic than in banking, measured in the hundreds of millions rather than billions, and with losses crystallising over a longer period. It is therefore appropriate from an economic perspective, and mandatory from a regulatory perspective, to hold capital against this risk.

For Canadian federally-regulated insurers, operational risk is a key risk that is required to be explicitly addressed within their own risk and solvency assessment (ORSA). Some provincial insurance regulators have also adopted the federal or similar ORSA guidelines as part of their supervisory framework. In addition, Quebec-regulated insurers are required to account for operational risk when establishing their target capital ratio.

Research and surveys indicate that (globally) insurers have not historically directed as much time and effort to analyzing, modeling, and quantifying operational risk as they have for other categories of risk, such as insurance risk and asset-related risks. There is, however, a trend towards greater regulatory attention directed at the potential effect of operational risk for financial institutions; and as a result, insurers have recently begun to focus on how operational failures can affect their business. Consequently, methods for modeling operational risk capital are being developed, and the literature supporting such methods is being published at a greater rate than in the past.

The Canadian Institute of Actuaries (CIA) Committee on Risk Management and Capital Requirements (CRMCR) issued a Request for Proposal (RFP) in the fall of 2013 for the publication of a research paper addressing approaches to modeling operational risk capital for insurers.¹ Funding for this research project is provided by the CIA Committee on Research.

Objectives of the Research Paper as Specified by the CIA

As part of the RFP, the CRMCR Operational Risk Subcommittee (CORS) was given the responsibility to oversee the research project on behalf of the CIA. The CORS identified the requirements of the research paper by articulating three key research areas of concentration:

- Identification and categorization
 - Identification of a mutually exclusive and collectively exhaustive list of operational risks that affect insurers;

¹ Throughout this research paper, the term “insurers” includes life, health, and property and casualty (P&C) insurers. P&C insurers are also known as general insurers or non-life insurers, particularly outside of Canada and the United States (U.S.). In this research paper, unless specifically noted otherwise, insurers refer to both primary insurers and reinsurers. Generally, the term “insurers” is used in this research paper instead of “firms”, which is the common term found in banking regulations and research related to operational risk for banks and financial institutions.

- Inclusion of definitions for various key operational risk terminology (specifically definitions used in different regulatory regimes around the world);
- Categorization of operational risks into those that are quantifiable in an economic capital context and those that require alternative treatment; and
- Description of a process to review and update the list of operational risks after the publication of the research paper, including the identification and categorization of emerging operational risks.
- Quantification methods
 - Description of different methods used to quantify operational risk capital including the advantages and disadvantages of each approach;
 - Discussion of implementation considerations including model calibration methods, methods for reflecting offset due to strength of operational risk management programs, reporting, and other considerations;
 - Inclusion of a bibliography outlining the published literature (e.g., academic, regulatory, actuarial, business, and surveys) used in the preparation of the research paper; and
 - Description of a process for augmenting the summary of methods after the publication of the research paper.
- Contrast and compare
 - Existing quantification methods currently being used to determine regulatory capital; and
 - Emerging internal model² approaches to operational risk quantification for capital purposes other than regulatory capital.

Research Approach

To conduct this research assignment, we began with the collection of numerous papers prepared by KPMG globally on the topic of operational risk. Next, we identified other key papers and publications through extensive internet research. We reached out by email to actuaries at the professional actuarial societies in:

- Australia;
- Ireland;
- South Africa;
- United Kingdom (U.K.); and
- U.S.

In addition, we contacted (by email and telephone) actuaries working in the area of operational risk from the International Actuarial Association (IAA). We reached out to representatives at insurance regulatory and industry bodies in Canada, the United States, and at the International Association of Insurance Supervisors (IAIS).

² The term internal model is used in this research paper to refer to an economic capital model, also known as an internal capital model.

Process to Review and Update Research on Operational Risk

It is expected that the major actuarial organizations around the world will continue to produce thought leadership on the topic of operational risk for insurers. The most efficient means to share the results of such work would be to create forums for ongoing communications in the area of economic capital modeling in general and operational risk specifically. Actuarial forums could use email, conference calls, web-based technology, and seminars for sharing not only the results of completed research efforts but also plans and priorities for future activities. Ideally, the actuarial organizations would work together to leverage off one another's efforts and not reproduce work that has already been undertaken.

Organization of the Research Paper and High Level Description of Key Sections

To meet the objectives of the CIA, this research paper is organized in the following seven major sections:

- Introduction;
- Definition of key operational risk terminology;
- Categorization of operational risks;
- Quantification Methods;
- Regulatory Regimes;
- Bibliography; and
- Appendices.

The following is a short high level description of each of the key major sections.

Definitions of key operational risk terminology

This section includes definitions of key operational risk terminology from the following organizations:

- Basel Committee on Banking Supervision;
- International Association of Insurance Supervisors;
- Canada – Office of the Superintendent of Financial Institutions;
- Europe – European Insurance and Occupational Pensions Authority;
- Australia – Australian Prudential Regulation Authority;
- Bermuda – Bermuda Monetary Authority;
- South Africa – Financial Services Board; and
- United States (U.S.) – National Association of Insurance Commissioners.

The formal definitions adopted by all of these organizations are essentially the same and are based on the definition originally set out for the regulation of international banks. In *Copulae and Operational Risks*, Dalla Valle et al. offer the following definition of operational risk:

A more precise definition of operational risks includes the direct or indirect losses caused by the inadequacy or malfunction of procedures, human resources and inner systems, or by external events. Basically, they are all losses due to human errors, technical or procedural problems or other causes not linked to the behavior of financial operators or market events.³

Through the implementation of Basel II, the Basel Committee on Banking Supervision sought to achieve international convergence for the supervisory regulations that govern the capital adequacy of internationally active banks.

Section V.A.644 of Basel II defines operational risk:

Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk.⁴

In *Operational Risk Reporting Standards 2011*, the Operational Riskdata eXchange Association (ORX)⁵ notes that the definition of operational risk is broadly worded and could lead to an interpretation that is too far-reaching. An overly broad interpretation could be problematic for events that have aspects of operational risk and are already included in the capital requirements associated with other risk types (e.g., credit, market, or insurance risk). As such, a discussion of the importance of identifying boundaries between operational risk and other risk categories concludes this section.

Categorization of operational risks

The CORS requested a comprehensive and mutually exclusive list of operational risks. This section provides lists of operational risk categories (ORCs) established by the following:

- Basel II;
- Institute and Faculty of Actuaries and the Risk Classification Working Party;
- Australian Prudential Regulatory Authority;
- Bermuda Monetary Authority and the *Insurance Code of Conduct*;
- Operational Risk Consortium⁶; and

³ L. Dalla Valle, D. Fantazzini, and P. Giudici, "Copulae and Operational Risks", *International Journal of Risk Assessment and Management*, Vol. 9, No. 3, 2008.

http://economia.unipv.it/pagp/pagine_personal/dean/FDG_final%20copula%20operational%20risk.pdf.

⁴ Basel Committee on Banking Supervision, "International Convergence of Capital Measurement and Capital Standards – A Revised Approach – Comprehensive Version", Bank for International Settlements, June 2006: s. 644.

<https://www.bis.org/publ/bcbs128.pdf>.

⁵ ORX was founded in 2002 and, according to its website, ORX created "a platform for the secure and anonymised exchange of high-quality operational risk loss data." ORX is owned and controlled by its 67 members, which include leading banks from 21 countries. Confidential data are only available to contributing members, but high-level data abstracts are available to the general public.

⁶ ORIC was founded in 2005 by the Association of British Insurers (ABI) and 16 insurers in part as a response to new solvency regulations for insurers in the United Kingdom, as set out by the UK Financial Services Authority (FSA), and Solvency II. The purpose of ORIC is to provide thought leadership about operational risk and to enhance the quantitative and qualitative understanding of operational risk.

- ORX.

As part of the first research area of concentration, the CIA also specifically requested the segmentation of ORCs into those that are quantifiable from a capital context and those that require alternative treatment. The extensive research conducted in preparation for this research paper did not uncover any papers that differentiated in any substantive way between those ORCs that can be readily quantifiable and those requiring alternative treatment. In fact, in the insurance literature, there are repeated references to the significant challenges in the quantification of operational risk in general.

Quantification Methods

There are countless papers on the topic of operational risk management and measurement, particularly directed at banks. These papers provide detailed theoretical presentations of various methods used to quantify operational risk. They also present the results of comprehensive case studies, some based on the historical experience of individual banks and others based on aggregated data for multiple institutions. One of the greatest challenges in preparing this research paper was culling through the multitude of papers with the goal to meet the objectives of the CIA. Finding up-to-date literature specifically applicable to insurers was also a challenge. While there are papers directed at insurers, they are far fewer than those directed at banks. Furthermore, some of the papers for insurers are now dated given the continued advancements in economic capital modeling, Solvency II, and the activities of the IAIS.

One of the reasons explaining the relatively limited number of papers focusing on operational risk for insurers is that many insurers currently rely on standard formulae developed by regulatory authorities to calculate operational risk capital instead of quantifying operational risk using internal models. Those insurers who do rely on models to quantify operational risk tend to be part of large insurance groups with a head office located in certain countries, such as the U.K. and Germany. Moreover, even when an insurer develops and uses an internal model to estimate capital requirements, it seldom models all risk categories with the internal model and instead relies on a standard formula approach for quantifying its operational risk. Key reasons why many insurers are not yet modeling operational risk include:

- The lack of credible data due to the relatively short time span for which historical operational risk loss data have been collected;
- The role of the internal control environment and its ever-changing nature, which makes historical operational risk loss data somewhat irrelevant;
- The important role of infrequent but very large operational risk loss events;
- The continued state of development for insurers' internal models and the rigorous governance framework surrounding the use of such models; and
- Cost-benefit issues that result in questions about the value of internal models given their significant implementation costs.

Given the limited practical experience related to operational risk modeling for insurers, one turns to the vast body of literature and guidance that have been developed on modeling for the banking sector. While significant differences exist in the details of the operational risks faced by banks and those faced by insurers, lessons can be learned from the banking industry's solutions to many issues related to the overall approach used to model operational risk.

The Quantification Methods section of the research paper begins with the identification and description of key issues affecting the use of any method (other than a standard formula) to quantify operational risk capital, including:

- Data;
- Use of expert judgment;
- Unit of measure / granularity;
- Dependence;
- Iterative nature of model-building;
- Cost-benefit analysis of advanced modeling for operational risk;
- Business environment and strength of existing management programs; and
- Validating the soundness of the capital management process.

This general section is followed by a description of the three primary methods found in the literature to quantify operational risks for both banks and insurers:

- Frequency-severity approach (known by banks as the loss distribution approach, or LDA);
- Causal modeling and Bayesian estimation techniques (including the use of key risk indicators); and
- Scenario analysis.

The research paper does not present the theoretical background for any of these methods. Numerous papers containing comprehensive theoretical discussions are herein mentioned for further reference.

A review of the published literature on operational risk reveals a distinction between models that are used for (a) quantifying operational risk and calculating economic or regulatory capital and (b) managing operational risk. Such a differentiation can present challenges as those models used to quantify operational risk can also be used for management and vice versa. The research paper focuses on models used to quantify operational risk rather than models used for operational risk management. The frequency-severity approach can be classified as a model that is used to quantify operational risk; whereas, key risk indicators and causal models (such as multi-factor models and Bayesian networks) are typically used to manage operational risk. As described in this section of the research paper, however, many believe that Bayesian networks are also valuable for the measurement of operational risk. Scenario analysis can be used to both quantify and manage operational risk.

In selecting a method to quantify operational risk, it is critical to carefully consider the definition of operational risk and any potential overlap with other risk categories. Many operational risks may already be considered implicitly as part of other risk event types. It is essential that boundary conditions be clearly articulated so that risks are neither double-counted nor overlooked.

With the introduction of ORSA in Canada, the quantification of operational risk is evolving rapidly. Many Canadian insurers are still at a very early stage of development when it comes to sophisticated modelling approaches for operational risk, and economic capital in general. Thus, the Quantification Methods section of the research paper provides an international perspective on current market practices, based on the results of KPMG's 2012 and 2013 global economic capital modeling surveys of insurers. The results of the KPMG

surveys are supplemented with findings based on assignments completed by KPMG with international clients in the area of operational risk modeling. Specific topics addressed include:

- The right level of operational risk capital to hold;
- Approaches used to model operational risk loss events;
- Techniques used to model operational risk loss events;
- Current industry practice for scenario workshops and scenario analysis;
- Sources of operational risk loss data most frequently used;
- Comparison of the standard formula with the Individual Capital Assessment (as used by the Prudential Regulation Authority in the U.K.); and
- Current practices for stochastic modeling.

Regulatory Regimes

The final section of the research paper begins with a description of the existing regulatory requirements related to operational risk for the banking sector as set out by Basel II. Next, key positions of the IAIS' Insurance Core Principles⁷ that address operational risk are discussed, followed by a summary of the current regulatory requirements related to solvency for insurers in the following countries (presented in alphabetic order):

- Australia;
- Bermuda;
- Canada;
- Europe and Solvency II⁸;
- South Africa;
- Switzerland;
- U.S.; and
- Other countries (including Brazil, Japan, China, Hong Kong, Taiwan, Korea, Russia, and Singapore).

⁷IAIS, "Insurance Core Principles, Standards, Guidance and Assessment Methodology", (1 October 2011, including amendments 12 October 2012 and 19 October 2013): s. 6, accessed on February 27, 2014, <http://www.iaisweb.org/Insurance-Core-Principles-material-adopted-in-2011-795>.

⁸ Solvency II, first adopted by the Council of the European Union and the European Parliament in November 2009, is a major regulatory initiative applicable to insurers operating in the European Union. A detailed description of Solvency II is contained in the Regulatory Regimes section of the complete research paper.